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OF THE
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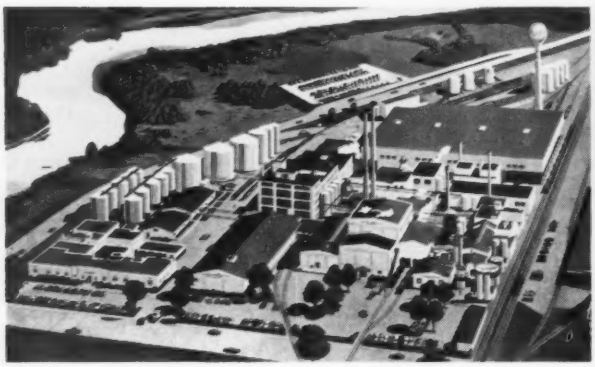

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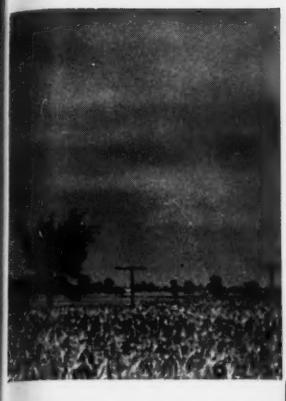

CEREAL SCIENCE today

FEATURES

DEPARTMENTS

STAFF

COVER: A saponification setup used in the determination of Vitamin A in feed products. (Photo courtesy of Pfizer Agricultural Research Center, Terre Haute, Indiana.)

CEREAL SCIENCE Today is published ten times per year (monthly except June and August) by the American Association of Cereal Chemists, from 500 South 5th Street, Minneapolis 15, Minnesota. Editorial, Circulation and Advertising Headquarters: 1955 University Avenue, St. Paul 4, Minnesota. Entered as second class matter at the post office at Minneapolis, Minn., under the Act of August 24, 1912.

Subscription rates: 1 year, $3.00; 2 years, $5.00; 3 years, $7.00. Foreign postage: $1.00 per year extra. Back issues available on request. Single copies: 35 cents.

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The Story of Nature's Yellow

WHY IS COLOR SO IMPORTANT?

Colors call to your appetite. You pick the big, red, beautiful apple and every bite seems to taste better because it's so nicely red. The good, thick steak looks crusty brown, and the center's a wonderful pink.

Some foods are naturally attractive. Some must be made so. Butter and margarine must be a good yellow for widest appeal. Gelatin desserts, children's lollipops and hard candy, soft drinks, ice cream, and many other foods must be colored for consumer acceptance. Man so often must help nature out!

Making foods look better, making them taste better, making them nutritionally more valuable are practices everyone accepts and expects. Food processors can now add pure beta carotene Roche* to give natural yellow color, plus vitamin A value, to their good foods.

WORDS AND MEANINGS

Carotene (sometimes spelled *carotin*) is the root word. It designates a color compound which occurs naturally in some vegetables and fruit.

Carotenoid describes a family of color compounds, found widely distributed in nature, which gives many flowers, fruits, leaves, and vegetables their characteristic color. The ending "oid" is the way chemists say: "like carotene." All carotenoids are similar, chemically, to beta carotene which is the most important and widely distributed member of the carotenoid family.

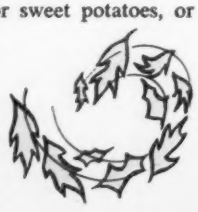
Beta Carotene. The Greek-letter prefix is used to distinguish this compound from *alpha* and *gamma* carotene — compounds which have somewhat similar chemical structure but are not nearly so important in human nutrition.

Provitamins describe substances which are changed in the body into vitamins. Beta carotene is a provitamin; the body converts it into vitamin A which we all need for good health.

*Roche — Reg. U. S. Pat. Off.

CAROTENE IS NO STRANGER

Carotene is as common as carrots, or sweet potatoes, or green leaves, or the natural yellow of butter. Carotene is the pigment which makes carrots, *carrot-colored*. Carotene and other carotenoids, with chlorophyll, are present in the green leaves of plants. Vivid proof of this is seen when tree leaves turn yellow in the fall.



A LARGE FAMILY WITH MANY RELATIONS

Nature has many pigments: the delicious red of a ripe strawberry, the many shades of green in leaves, the blue of cornflowers, the lavender of lilacs, the differing browns of bark, the bright yellow of daffodils, the darker yellow of plump pumpkins.

All of the carotenoid colors have somewhat the same chemical structure. As their chemistry varies, so do their properties. Different carotenoids may exist side by side, as in some tomato species which contain beta carotene and lycopene, the so-called tomato red.

No one knows exactly how many carotenoids there are in nature. Some authorities believe there may be as many as 200.

Of all the carotenoids now known, beta carotene is the most useful for human beings, because of its value as a provitamin A. Not all carotenoids are provitamins. Alpha carotene, gamma carotene, cryptoxanthin (found in yellow corn) and some less well-known compounds have this property to only a limited extent.

BETA CAROTENE DESCRIBED

In pure form, beta carotene is deep violet-red in color; in dilutions its color is yellow. The crystals are flat platelets in form. The pure product has very powerful coloring properties. For example, three grams of the pure crystals, enough to cover an American quarter-dollar, will color a half-ton of margarine to the accepted yellow color.

Beta carotene is soluble in various oils, vegetable oils being preferred for food use. It is insoluble in water.

In the solutions customarily used in food processing, beta carotene Roche has practically no odor or taste, nor does it impart any odor or taste to the foods with which it is mixed.

Only a minute amount of crystalline beta carotene is needed for coloring. To simplify measurement for food processors, Roche has made suspensions of its finely ground crystals in vegetable oil. These are standardized, so that products with uniform color will result when they are used.

BETA CAROTENE IS A SAFE COLOR

Beta carotene is one of nature's own coloring agents. It has been consumed in food for thousands upon thousands of years. Even with this evidence of safety in usage, Hoffmann-La Roche did not market its man-made duplicate of nature's product until careful studies showed that this substance produced no undesirable effects in test animals. These and other tests indicate that beta carotene produced by the Roche process is safe and desirable for use in foods.

...BETA CAROTENE

by SCIENCE WRITER

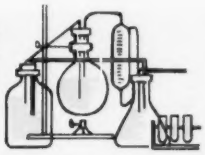
A CAPSULE HISTORY

In 1831, Wackenroder, curious to know what caused the characteristic color of carrots, isolated carotene from the roots of that vegetable. Based on his observation, Willstätter established carotene's empirical formula in 1906.

In 1919 the vitamin A activity of the carotenoids was discovered by Steenbock.

Between 1928 and 1930, Zechmeister, Karrer, and Kuhn established the constitution of carotene and assigned its structural formula.

In 1953, the successful synthesis of beta carotene was made by Hoffmann-La Roche whose chemists *duplicated* nature's own color in the laboratory. Commercial production followed within a year.



Carotene has been used by food processors in the United States for many years. Natural extracts have been made from carrots, palm oil, alfalfa, and other sources for more than 25 years. None of these natural extracts, however, has the purity of the man-made substance produced by Hoffmann-La Roche.

FOODS USING BETA CAROTENE

Beta carotene Roche is now used every day as a safe, natural, yellow coloring agent for such foods as:

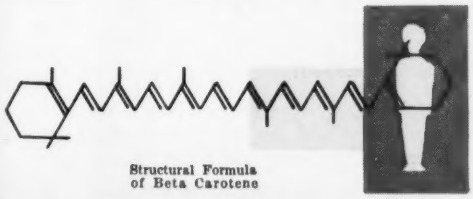
Margarine	Salad and Cooking Oils
Shortening	Confections
Lard	Yellow Baked Products
Butter	Beverages
Cheese	Ice Cream Products

It is capable of being used in almost any processed food. Developments at Hoffmann-La Roche have made it available for use in fatty foods and in special water-dispersible form for other foods.

An acceptable coloring in the U.S.A. since 1947, beta carotene has also received official sanction in Austria, Australia, Denmark, Finland, Brazil, Germany, Great Britain, The Netherlands, Norway, and Switzerland.

NUTRITIONAL VALUE

Beta carotene is a provitamin; it is converted into vitamin A in the healthy human body.



Structural Formula of Beta Carotene

Its biological activity is measured in units of vitamin A activity. One gram of beta carotene equals 1,666,700 U.S.P. units of vitamin A, while a gram of vitamin A (alcohol) equals 3,333,300 U.S.P. units. One U.S.P. unit is equal to 0.344 micrograms of vitamin A acetate.

We need vitamin A to guard the health of our eyes and our skin, membranes, and other specialized tissues. It helps build our resistance to infections. Vitamin A is needed for normal growth from infancy to maturity.

Beta carotene Roche is more than just another efficient food color. As it is so intimately associated with vitamin A, it comes close to being an essential substance in itself.

Of the six provitamins A known to exist in nature, beta carotene is the most widely distributed, the most potent in vitamin A activity, and the most readily available.

The Food and Nutrition Board of the National Research Council recommends that healthy adults in the U.S.A. receive 5,000 U.S.P. units of vitamin A daily in their diets. The requirements for pregnancy, for infants and children, vary above and below this amount.

OPENING ANOTHER DOOR TO THE FUTURE

The successful synthesis of vitamin A by Roche scientists led to the synthesis of beta carotene. The latter synthesis will no doubt lead to the manufacture of other carotenoids. Right now, work is being done on "duplicating" lycopene, the dominant red of tomatoes, and on cryptoxanthin, a yellow color found in corn. The development of pure beta carotene Roche is really only a beginning, not an ending.

SOME NEW WORDS ON FOOD PACKAGES

The identifying words: "artificially colored with beta carotene" on the labels of margarine, yellow shortening, yellow cake mixes, and various other food products signify that the manufacturer has used a safe yellow color which was conceived by nature itself for coloring foods and adding to their nutritional value.

HELP FOR YOU

Reprints of this article are available in reasonable quantities as a teaching aid or for public education. For food processors the Roche technical brochure is available. Those interested specifically in the scientific study of beta carotene will find published material from Roche most helpful. In making your request, please specify the type of information you want. There is no charge, of course.

Please address all requests to Vitamin Division, Department of Education, Hoffmann-La Roche Inc., Nutley 10, N. J. In Canada: Hoffmann-La Roche Ltd., 1956 Bourdon Street, St. Laurent, Montreal 9, P. Q.

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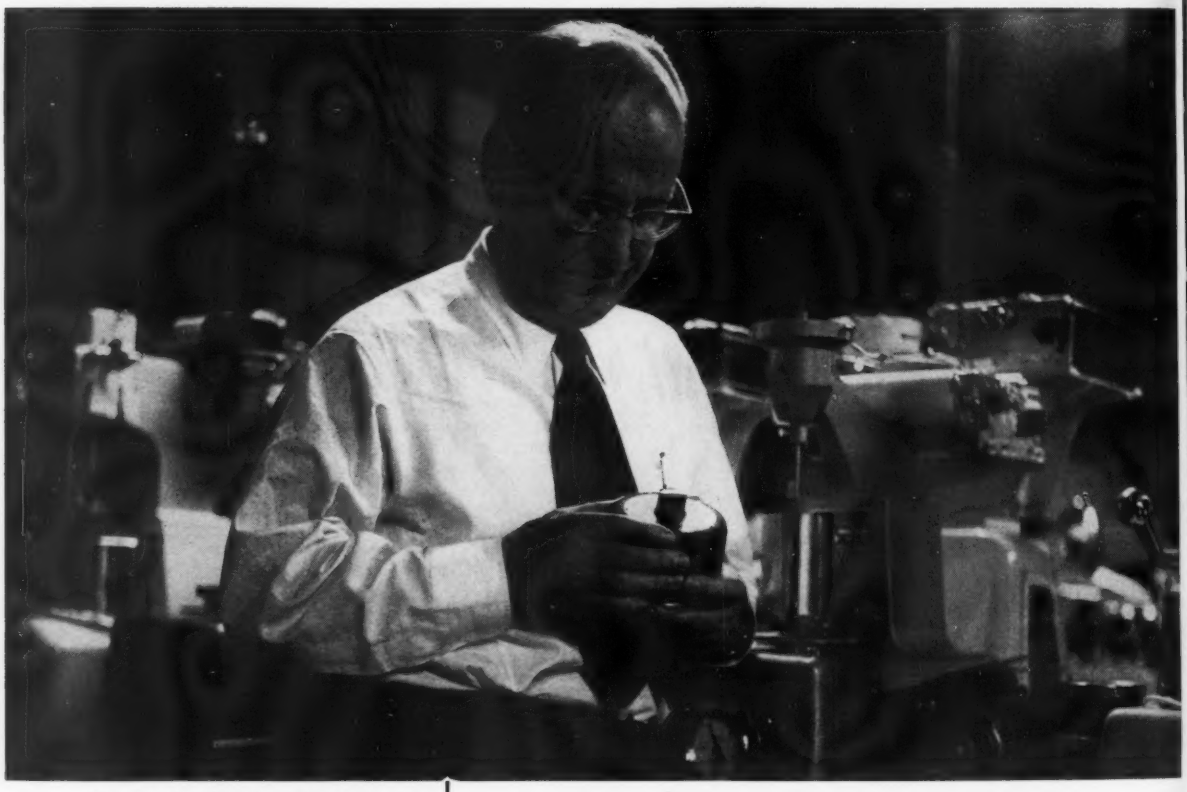

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Editorial

A PREVIEW OF the program planned for the 1960 meeting of the American Association of Cereal Chemists to be held in Chicago May 1-5 will be found on page 65 of this issue of CEREAL SCIENCE TODAY. We think cereal chemists will be pleased by what they see. Program Chairman Robert Koch and his committee have done an outstanding job.

Viewed in comparison with all science and technology, cereal chemistry is a relatively narrow field of specialization. Yet the titles of papers on this annual meeting program reveal an amazing range of topics, each with a logical, explainable relationship to the interests of AACC members. In addition to the latest findings on the composition of cereal products and descriptions of devices useful in cereal laboratories, there are papers on industrial processes, nutrition, rheology, microscopy, X-ray diffraction, and enzymes, among others. Even psychology enters the program in discussions of flavor and consumer motivation.

Here is an excellent example of how both research and applied technology draw upon various scientific disciplines. Indeed, the rapid progress that characterizes technology today is largely brought about by communication of new knowledge and techniques between different areas of specialization. A new tool or approach to a problem is more likely to be an adaptation of something else than a totally new innovation.

While there are many media that play a role in scientific communications, a meeting such as that planned for Chicago offers certain unique advantages to those who attend. There will be opportunity to strengthen understanding and rapport among cereal chemists; also, opportunity for the chemists to communicate with others sharing similar interests. To the individual, the most important discussions at the meeting may not appear on the program nor ever be published, but they may be inspired by the formal program and, in turn, even largely determine the programs of future meetings.

PAUL E. RAMSTAD

CURRENT STUDIES ON

The Role of Lipids in Baking

By Robert L. Glass, Department of Agricultural Biochemistry, University of Minnesota, St. Paul, Minn.

THE SUBJECT OF flour lipids and their possible importance in the baking process is one that has intrigued chemists and occupied their attention for a good many years. The problem is not only very interesting and exceedingly important; it is also a difficult one.

It is becoming increasingly evident that the lipids of flour, although small in quantity, are a very vital factor governing the over-all quality of flour. As yet we do not know exactly how this is brought about, but we are learning rapidly. Through techniques which were largely unknown a very few years ago, new information is being obtained. A continuation of the present rate of progress will undoubtedly eventually clarify what is, as yet, a controversial and baffling situation.

Phases of the Problem

The problem of the role of lipids in baking can be divided into several phases. The first of these consists of a complete qualitative and quantitative examination of the lipids present in wheat and in flour; we must eventually know what is there, and how much. We can then proceed to study the reactions which these substances undergo during the breadmaking process, and finally to ascertain in what way these reactions influence quality.

If we accept the loose definition of lipids as being substances which are insoluble in water but are soluble in the so-called fat solvents, then wheat contains from 2 to 3% lipids, depending on the solvent used, the variety of wheat, the growing conditions, and state of maturity. The germ contains the highest and the endosperm the lowest amounts, with the bran somewhere in between. There are differences in the composition of the lipids of these three distinct parts of the wheat kernel. The germ has the highest percentage of unsaponifiables and endosperm the lowest; the germ and bran have a greater content of the more highly unsaturated fatty acids than the endosperm. Germ lipids likewise have a considerably higher saponification number than do endosperm lipids, indicating a greater concentration of triglycerides in the germ.

With these differences in amount and kind of lipids in various parts of the kernel, it is to be expected that when wheat is milled into flour the composition and quantities of the lipids in the flour change continually with increasing refinement, so that the finished flour contains endosperm lipids plus varying amounts of germ and bran lipids. The term "flour lipids," then, designates an extremely complex mixture of substances related to each other, perhaps only casually, by their solubility characteristics. It is extremely unlikely that any two flours will yield identical substances or quantities of these substances upon solvent extraction. When one considers that various investigators in the past, as in the present, have worked with flours of different wheats grown under different conditions, milled to different extractions, and whose lipids have been extracted with a wide variety of solvents, it would seem rather unlikely that results would be in agreement. A survey of the literature soon reveals that such indeed has been the case.

Bound vs. Extractable Lipids

Remarks thus far have been confined to the lipids readily extracted from flour. There is also present an additional amount of lipid which is bound in some way, presumably as lipoprotein, and whose removal requires treatment with a solvent such as water-saturated 1-butanol, aqueous ethanol, or acid. Once liberated by such treatment, most of this material is then soluble in a solvent such as chloroform or petroleum ether. "Bound" lipid comprises a relatively small percentage of the total flour lipid; when flour is kneaded into a dough, however, virtually all of the originally "free" lipid becomes similarly bound in the gluten and only a small amount of the total is readily extractable. It has been shown (13), for instance, that about 70% of the total lipids were extractable from flour by diethyl ether, but only 6% could be so extracted after the flour was worked into a dough and dried. Fractionation studies further demonstrated that more than 80% of the total lipid bound during the dough mixing process was done so by the "glutenin" fraction and only 5% by the "gliadin" fraction.

The percentage of the total lipid in flour that is readily extractable varies considerably as the refinement changes. Thus a straight-grade flour was found to contain 45%, a clear 40%, and a patent 63% of their lipids in a readily extractable form, although all flours were milled from the same grist (4). These figures may change considerably between varieties of wheat.

Identification Techniques

Identification of the various lipid materials present has been progressing somewhat slowly. Although a considerable amount of effort has been expended over the years, what we know today is still woefully incomplete. One of the chief difficulties has been the isolation of the various

lipid components, which is a prerequisite to identification. Until quite recently there has been a lack of competent techniques available to the lipid chemist for such work, but several tools are now available. One of these is countercurrent distribution, which produces a separation of substances on the basis of solubility.

Using two immiscible solvents such as 1-butanol and *n*-heptane, the substance to be fractionated is simply shaken with the solvent mixture until equilibrium between the two is reached. The solvents are separated and the top layer added to a fresh portion of bottom layer, and the bottom layer added to a fresh portion of top layer. The process may be repeated as many times as is consistent with either the size of the apparatus or the patience of the investigator. Separations previously virtually, or entirely, impossible can thus be achieved.

This method was recently (8) applied to a comparative study of the phosphatides in a baking flour of good quality and one of poor quality. The system involved 800 transfers and required 3 weeks for the process. The investigators found at least 30 different solubility classes present in the phosphatides alone, including a number of compounds containing galactose. It is only rather recently (2) that Carter and his co-workers reported the presence of mono- and digalactosyl glycerides in wheat flour, and although their importance is not yet known it may be speculated upon, because of the structural similarity between them and known bread softeners. The fact that digalactosyl glycerides comprised about 40% of the total phospholipids would certainly indicate that further study of these interesting compounds is warranted.

Gas chromatography, which is still in its infancy, also promises to be a valuable research technique for the lipid chemist. Its usefulness, of course, is limited to a study of volatilizable substances, or substances which can be rendered volatile by chemical treatment such as the conversion of fatty acids to their methyl esters. However, much information can be gained from its use.

An enzymatic approach to the study of mixed triglycerides has recently been developed which appears to have solved the question of the randomness or nonrandomness of the structure of such compounds. Pancreatic lipase has been shown (9) to be specific for the hydrolysis of ester linkages of triglycerides at the 1,3 position leaving a product consisting of essentially 2-monoglycerides. Several studies (10,14) on plant lipids have shown that in all cases the No. 2 position in a triglyceride is esterified quite specifically with unsaturated fatty acids and the 1,3 position with predominantly saturated fatty acids. The same was found to be true of animal triglycerides, with pork the only exception. Wheat lipids, however, do not appear to have been studied by this method.

The Lipoprotein Complex

Studies directed towards elucidation of the composition of wheat and flour lipid materials are fraught with difficulties other than the matter of availability of techniques. Many of the substances are quite labile and must be handled very gently. This appears to be particularly true of lipoproteins. They are, for instance, denatured by drying and by freezing. In view of the apparent importance of lipoproteins in dough it is quite essential that our knowledge in this field be advanced. X-ray examination of gluten has been rewarding (14). It has shown that wheat gluten contains a characteristic pattern which distinguishes it from all other cereals examined. The patterns were interpreted as showing the protein fibers held together by phospholipid molecules in bimolecular leaflets arranged along the fibers and at right angles to them.

Lipid Binding in Gluten

The nature of the bonds by which lipid and protein are held together is very imperfectly understood, but it is certain that in gluten a number of different types of bonds are present. The observation (12) that salts decrease the amount of lipid binding which occurs during gluten formation suggests that at least a portion of the lipid is bound by electrostatic, or saltlike, linkages. Such a bond could readily exist, for example, between the trimethyl ammonium group of lecithin and a negatively charged group of a protein molecule. However, linkages of this type could account for only a small portion of the total flour lipids bound by gluten.

Triglycerides, which constitute a sizable fraction of the total, have no such charged sites and must be held by the gluten in some other manner. One possibility is the formation of solid solutions of triglyceride in the prosthetic lipid portion of a lipoprotein. Another is that suggested by Macheboeuf and Sandor in 1932 (7). They proposed that a mutual attraction of the hydrophobic groups of the protein and lipid brings the two together, while the hydrophilic groups of the lipid molecules, extending outward, maintain a layer of water about the complex. This prevents the entrance of ether and other nonpolar solvents, but not polar substances such as ethanol or butanol, which can thus disrupt the lipoprotein complex.

It has also been suggested that the double bonds of unsaturated fatty acids are of importance to the uptake of glycerides (15). In a study using fatty acid methyl esters, it was observed that their uptake by gluten increased with increasing iodine number, with no uptake of saturated fatty acid esters. Work of this type with triglycerides would be required before one could translate these results to flour lipids. It is, of course, most likely that a variety of linkages exist within the gluten mass. The truth of the matter is, however, that we know virtually nothing about them. This would surely be a fruitful field for basic research. A thorough study of the interactions between flour lipids and protein is required before we can speak with any certainty about the importance of this very complicated group of substances in the baking process.

Reactions during the Baking Process

This, of course, is only one phase of the problem. We must know not only what compounds are there but also what reactions they undergo during the baking process and what effect these have on the ultimate baking quality of the flour. These phases of the problem have received a good deal of attention to date, and there is every indication that profound effects are caused by the flour lipids in the baking process. The older literature contains many reports of research directed towards establishing just how important the flour lipids are to baking quality. These works are reviewed elsewhere (1,3,11) and they will not be entered into here, except to say that the results have been contradictory in the extreme. There has been a general lack of agreement,

for instance, on the apparently simple problem of the effect of solvent extraction of flour on its baking quality. The reason for this awaits future work. One can only credit it to differences in the flours and in techniques used by various investigators.

Although little success has been obtained in an over-all evaluation of the role of lipids in baking, the results of investigators who have been engaged in work on the various stages of the baking process have been more encouraging; eventually they will be pieced together to complete the picture.

Some interesting studies have been made (5) of the bleaching which occurs during the batter process of doughmaking. In this process half of the flour and all of the water for a dough are mixed in specially designed equipment at high speeds. The batter so produced is then transferred to a conventional doughing machine and the remainder of the flour added and made into a dough. The result is a considerable degree of bleaching and dough improvement without chemical treatment. The process was shown to be considerably improved by the addition of 0.1% untreated soy flour.

These workers further showed that the improvement brought about by the batter process was quite dependent upon the presence of oxygen and not, as might be suspected, on the amount of mechanical work, *per se*, which the dough received. Thus when the batter was made in an atmosphere of nitrogen the dough improvement and bleaching did not occur. Further, when an atmosphere of oxygen was used, rather than air, the improvement both as regards pigment destruction and loaf volume increase was greater. The removal of fats, the presence of which is required for lipoxidase action, did not completely prevent the improvement brought about by the batter process. This was interpreted as indicating that improvement by molecular oxygen was independent of intermediate fat peroxidation. It should be mentioned, however, that the solvent used, petroleum ether, would only have removed the "free" lipid portion, a fraction which, as will be shown presently, is of relatively little importance in the uptake of oxygen by dough.

Effect on Oxygen Uptake in Doughs

More recently the effect of flour lipids upon the rate of oxygen uptake by doughs has been studied (16). By direct measurement it was demonstrated quite effectively that the uptake of oxygen during mixing was the result of an interaction between lipid and a water-soluble substance in the flour which, to a considerable extent, involved the gluten. In other words, there were three parts to the system — the water-solubles, the gluten, and the lipids. Removal of any one component greatly reduced the rate of oxygen uptake. The uptake of oxygen proceeded when linoleic and linolenic acid, but not oleic acid, were added to previously defatted flour. The water-soluble substance required was found to be heat-labile, with a pH optimum at about neutrality. These facts are all consistent with the explanation that the effects observed are the result of the action of lipoxidase which is present in the flour and which utilizes atmospheric oxygen to oxidize linoleic and linolenic acid, whether in the free or the glyceride form.

These workers observed that the addition of a commercial lipoxidase preparation to flour caused a slight increase in mixing time and a considerable decrease in mixing tolerance. This observation is at variance with an earlier one (6) that the same commercial lipoxidase preparation, when added to full-fat flour, caused a marked increase in mixing tolerance. This did not occur when the enzyme preparation was added to defatted flour, or when the lipid was removed, oxidized enzymatically, and returned to the flour. Here again, then, was evidence of the requirement of the complete lipoxidase system; that is, the enzyme, the fat, and oxidation of the latter in the presence of the flour proteins. The reasons for the differences in results of these workers can probably be explained by the difference in levels of lipoxidase used. A level of 1% increased mixing tolerance; a level of 2% decreased it. The observed differences may thus be due to the use, in the latter case, of an excess of oxidant.

Relation to Bromate Action in Dough

The relationship between flour lipids and the improving action of potassium bromate has been studied (4), with very interesting results. The course of bromate decomposition was followed by measurement of residual bromate and it was observed that extraction of flour by petroleum ether resulted in a 30% decrease in the rate of decomposition. Extraction by the more efficient water-saturated 1-butanol caused a 78% decrease in bromate decomposition when this flour was made into a dough. Thus, flour lipids, and more specifically the "bound" lipids, appear to be involved in bromate uptake by doughs. These workers further showed that the "bound" lipids can only function in this reaction in the condition in which they are present in the original flour. Thus, returning the petroleum-ether extractables to the defatted flour restored the rate of bromate decomposition to normal. Removal of the bound lipids causes an irreversible loss in bromate utilization, and returning these lipids to the flour does not restore the utilization of bromate.

Bromate utilization or decomposition and free oxygen uptake appear to be involved in the same reaction. Thus, the presence of oxygen inhibits bromate uptake; or, stated another way, in the absence of oxygen, bromate uptake is enhanced. These effects are magnified by the absence of lipid. When the studies were repeated on defatted flour the uptake of bromate was virtually eliminated by oxygen. A proposal was advanced on the basis of this work to explain the contradictory results obtained when defatted flour is baked. This is, stated simply, that some defatted flours incorporate enough oxygen during mixing to effect overimprovement; for others, only enough is incorporated to give maximum improvement. In the former case a decreased loaf volume would result and in the latter an increase. The amount of oxygen taken up might well vary with mixing time, mixing speed, or type of mixer, and also with the particular flour.

Conclusion

The work discussed here appears to point to only one conclusion: that lipids function as a vital intermediate between oxidative agents, whether bromate or the lipoxidase-catalyzed oxidation using molecular oxygen, and the flour proteins. The lipids involved appear to be predominantly

(Please turn to page 75)

TRACING THE ORIGIN OF

Animal Fragments in Cereal Products

By George B. Wagner, Director, Economic Biology Department, The Pillsbury Co., Minneapolis, Minn.

FOR THE PAST two decades, technicians have been debating the identification and origin of the insect fragments frequently found in cereal products. Among them, differentiation between tissue of animal and/or plant origin is still often controversial.

It is of primary importance to determine whether a fragment is from a vertebrate or invertebrate, for this is the key to its origin. Obviously, the ecology of the contributing species must be understood. If a sample of a cereal product is representative and if analytical methods are adequate, a complete story will be revealed under the microscope. Then if this story is rightly interpreted, corrective measures will often be clearly indicated.

Grains may be defined as raw agricultural products; they are grown in many different geographical areas of the United States. Wheat grown in Montana may be processed into cereal products in Buffalo, New York; wheat grown in the Southwest Plains may, depending on various factors and conditions, be milled in Buffalo, or in Los Angeles, California; and so on. Thus the grain itself is subject to contamination of many different kinds and in many different places. This situation differs from that of raw milk, which is produced under adequate local sanitary inspection. The possibility of similar control over country grain storage and grain marketing, however, leaves much to be accomplished, if contaminating fragments in human cereal food are ever to be completely eliminated.

Hidden Infestation — Weevils

When wheat arrives at a mill it may, and often does, harbor internal forms of weevil life hidden within individual kernels. Various techniques for detecting these hidden forms have been reported. Milner *et al.* (6) showed the X-ray technique to be very effective in detecting hidden infestation.

The true weevil lays its eggs within the wheat kernel; upon hatching the young larvae grow to maturity protected within their food medium. If in the cleaning process or prebreak aspiration the larva is in the first instar, its removal at this stage of milling is very doubtful. As the larva grows, the structure of the kernel is weakened accordingly. Hence, scouring and aspiration are more likely to fracture kernels containing half-grown to full-grown larvae, exposing these insect forms to screening and aspiration during the cleaning process. If these young larvae are not removed (and they will not be so removed in the first two instars of their growth), small fragments representing the head capsule and mouth parts will almost certainly appear in the finished product.

Burquest (1) estimated the number of weevil larvae removed from wheat infested to various degrees by mill-cleaning equipment as follows:

Wheat Lot (Internal forms)	*Insects*
7	8,500
12	17,500
21	180,000
19	220,000

Burquest also demonstrated that milling of infested wheat is uneconomical.

Beetles and Mites

Prior to 1950, entomologists considered the saw-toothed and flat grain beetles and grain mites to be free-living and readily removed by the cleaning process prior to milling. About that year, it was found that the females of these insect species tuck their eggs into a break of the bran coat between the germ and the endosperm; the eggs hatch into small larvae which, as they grow, weaken the germ. If sufficiently weakened, the germ is broken in the cleaning process and the larvae are removed by aspiration and screening. If the germ is not sufficiently weakened, the larvae pass through the cleaning process unharmed, and portions of their bodies remain as fragments in the finished product.

Mites tend to congregate between the germ and endosperm of those kernels where a break appears in the bran coat at the germ end. If few in number and they have been in this habitat but a short time, they also will pass unharmed through the grain-cleaning machinery. Unfortunately, the X-ray technique will not show mites or small larvae of the flat and sawtoothed grain beetles in this location.

If the analyst finds larval fragments of these beetles and of the true weevil, and occasionally of mites, it is certain that they originated in the wheat, and the miller can do little to prevent such an occurrence. Under unusual conditions it is possible for a dead adult of "true weevil" species to pass through the cleaning process within an individual kernel. Such an insect will be shattered in passage through the rolls, and its fragments, identifiable as those of an adult of the species, can be found in the end product.

A brief resumé of the milling process will illustrate the travels of insects that may be harbored in the grain. After the wheat is thoroughly

cleaned and conditioned, it passes into surge or holding bins and from there goes through the milling machinery, a process of reduction into flour fractions, cereal products, and/or animal feeds. The first break roll is corrugated and so operates as to — figuratively — turn the wheat kernel inside out. After this first breaking process the stock goes to a sifter and is separated into second break stocks, chunks or sizings, middlings, and some flour. Thereafter the milling process is a continual reduction, sifting, and purification, each sifting process yielding some flour of a particular grade.

Flour Beetles – Red and "Confused"

In the modern flour mill, the only insect species that defy the most effective sanitation programs known to science are the red and the confused flour beetles. Within the milling industry, their numbers in any of the above-mentioned locations have been reduced, from those of 30 years ago, to a fraction of 1%. Occasionally, however, individuals of these species will be fractured and the fragments will reach the finished product.

Living forms of these two species contain approximately 55% water (by weight). If individual living forms pass through the break rolls, the fragments are likely to be shredded rather than shattered. The moisture of the insect body will form small dough balls with flour. Such fragments "tail over" the fine silk bolting cloth and will generally pass into animal-feed fractions. Dead and dehydrated insect bodies, on the other hand, will shatter, perhaps into sufficiently fine particles to pass through the bolting cloth. A single dehydrated flour beetle specimen can shatter into 800 to 1,200 fragments in passing through a smooth reduction roll (such as fifth middlings or first tailing).

The presence of beetle fragments in flour samples at the mill laboratory is a strong indication that some changes should be made in the sanitation program. Since the flour has not been in transit and/or consumer channels, the fragments must have originated from insects in the flour machinery.

Air-Borne Contamination

Many contaminating fragments of insect, rodent, and bird origin may become incorporated in any food product from air sources. Claydon (2) collected insect fragments, rodent hair fragments, and bird feather fragments in air samples from dairy farms, cream collecting stations, and dairy processing plants. Gressitt and Nakata (3) collected insects from air samples on ships on the Pacific Ocean. Johnson and Taylor (5) measured insect density in the air at various heights in the atmosphere above sea level.

The Sanitation Committee of the AOM has records (unpublished) of rodent hair fragments being collected in the atmosphere around office buildings, food processing plants, warehouses, and homes. Authorities on rodent and predator control have estimated the rat population of the United States to be equal to the human population. A single rat, they point out, may shed a million hairs per year. These hairs become brittle, break into innumerable fragments, and readily become air-borne. In the spring of the year when ground surfaces are bare of growing vegetation and during periods of high winds, this type of contamination is to be expected.

Our technical knowledge of air engineering must be increased. Most food processing requires various amounts of air; some types of grain milling require a million cubic feet per minute. But few, if any, of our mills or bakeries are equipped with air conditioning; that is, a system by which atmospheric air is passed through filters that retain or remove rodent hair fragments. The sums of money required to so equip all the food plants in the United States are beyond our individual and collective comprehension. Thus, we can expect air-borne contamination to remain a factor in the immediate future.

Conditions in Transit and in the Home

After flours and cereals are packaged for human foods, they still are exposed to contamination in transit and in the hands of the consumer. Employees dumping sacks of flour into cut-in or conveying hoppers are instructed to brush the exteriors of the bags before opening; but neglect of this precaution means that, in the last sequence of motion — a vigorous shake of the bag to get the last ounce of flour from the container — mouse pellets, dead insect bodies, and wood splinters picked up in transit will be incorporated with the flour.

Except for those made of properly sealed metal, insects can penetrate any of today's food containers. The canny adult female lays eggs along the flaps and seams of container seals which may seem perfect to you or me; yet macroscopic imperfections actually are numerous, and newly hatched larvae can penetrate openings as small as 0.018-inch. The reproductive potential of a single pair of flour beetles, according to Gray (4) is 1,062,000 within 150 days. Many of these small, newly hatched larvae will die without gaining entrance into the food container, but a few will succeed. When samples representing these conditions are analyzed, cast skins of growing larvae and dead and dehydrated larvae appear under the microscope. If foods so exposed to insect infestation are stored for a sufficient time, the small larvae will become pupae, and in due time adults will emerge in the food within the containers. Mating will occur if the sexes are so distributed, and the life cycle begins anew, this time from life *within* the package.

Thus, we see the interrelationship and interdependence of the various industries whose efforts result in the appearance of bread and cereals on the American dining table. It is all too easy for any one of them to accuse others of being solely responsible for those disgusting and inexcusable small particles known collectively as contaminants.

Our Responsibility

Farmers, transportation agencies, grain merchandisers, millers, bakers, warehousemen, grocers, and even the homemaker must accept their proportionate share of responsibility in protecting our cereal foods against destruction and defilement by pests of all kinds.

We split the atom, we place missiles into orbit in outer space — and yet we are unable to eliminate the common housefly. In the same thoughtless manner we permit rats and mice to multiply and to defile and destroy our food supply and spread disease among ourselves and our domestic animals. The task of eliminating the pests discussed above is too formidable to be accomplished by a small group of scientists and technicians. We must continue to contribute our

(Please turn to page 75)

PRELIMINARY PROGRAM

45th

ANNUAL MEETING

☆ ☆ ☆

AMERICAN ASSOCIATION OF CEREAL CHEMISTS

May 1-5, 1960

MORRISON HOTEL • CHICAGO, ILLINOIS

GENERAL PROGRAM

Sunday, May 1

Registration
2:00 p.m.–8:30 p.m.

Editorial Board Meeting
1:00 p.m.

Board of Directors Meeting
2:00 p.m.

Technical Policy Committee Meeting
(Time to be announced later)

President's Reception
8:30 p.m. Embassy Cotillion Room

Monday, May 2

Registration
8:00 a.m.

Exhibits
9:00 a.m.

Opening Session
9:30 a.m. Grand Ballroom

General Technical Session
1:30 p.m. Grand Ballroom

Tuesday, May 3

Registration
8:30 a.m.

Exhibits
9:00 a.m.

Technical Sessions
9:00 a.m. Concurrent Sessions — Grand Ballroom and Venetian Room
1:30 p.m. Concurrent Sessions — Grand Ballroom and Venetian Room

Wednesday, May 4

Registration
9:00 a.m.

Exhibits
9:00 a.m.

Technical Sessions
9:00 a.m. Concurrent Sessions — Grand Ballroom and Venetian Room
1:30 p.m. Concurrent Sessions — Grand Ballroom and Venetian Room

National and Section Officers Luncheon
12:15 p.m.

Cocktail Party (sponsored by Allied Trades)
6:00 p.m. Embassy Cotillion Room

Banquet and Dance
7:00 p.m. Grand Ballroom

Thursday, May 5

Technical Committee Meetings
9:30 a.m.

Board of Directors Meeting and Luncheon
10:00 a.m.

Annual Business Meeting
2:00 p.m.

Adjournment
3:00 p.m.

LADIES' PROGRAM

Sunday, May 1

2:00 p.m. Hospitality Room opens

8:30 p.m. President's Reception — Embassy Cotillion Room

Monday, May 2

8:00 a.m. Continental Breakfast (courtesy Sterwin Chemicals, Inc.) and Get-Acquainted Period

9:30 a.m. Tour of Chicago's South Side (University of Chicago, Museum of Science and Industry, Oriental Institute, etc.)

Noon Luncheon at South Shore Country Club (courtesy of Wallace & Tiernan, Inc.)

Tuesday, May 3

8:00 a.m. Continental Breakfast (courtesy Corn Products Co.)

9:30 a.m. Tour of Chicago's North Side

Noon Luncheon at Kungsholm Restaurant (courtesy Merck & Co.)
Miniature Grand Opera to follow lunch. Children will be taken to Lincoln Park Zoo

Wednesday, May 4

8:00 a.m. Continental Breakfast (courtesy Midwest Section)

Noon Luncheon Styleshow in Wedgewood Room of Marshall-Field, Inc. (courtesy Durkee Famous Foods, Inc.)

Thursday, May 5

9:00 a.m. Continental Breakfast (courtesy Chas. Pfizer & Co.)
Tickets will be available for TV and Radio shows

TECHNICAL PROGRAM PAPERS

Viewpoints on Our Industry

(Exact titles are not available as yet; the following are the speakers and general area to be covered. The talks will be 40 minutes and will deal with recent progress and the future of these research areas.)

Feed Nutrition
SAMUEL LET

Milling and Flour Research
REZSOE GRACZA

Fermentation Research
CHARLES N. FREY

Cereal Research in General
CLINTON L. BROOKE

Cereal Processing and Flour Research

World-Wide Developments in Wheat Milling
J. A. SHELLENBERGER

Corn Wet Milling — Process and Progress
J. W. EVANS

Wet Milling High-Amylose Corn Containing 65–70% Amylose Starch
R. A. ANDERSON, C. VOJNOVICH, and E. L. GRIFFIN, JR.

New Process Bulgor Wheat
W. L. HEALEY and J. W. PENCE

Non-Food Uses for Wheat Flour
C. E. RIST and C. R. RUSSELL

Effect of Bleaching on Flour as Measured by Structural Relaxation in Dough
ENDEL JASKA

Measurement of Improver Response in Dough
I. HLYNKA and R. R. MATSUO

The Improving Action of Hyprobromite in Dough
R. TKACHUK and I. HLYNKA

Flavor Research

Basic Flavor Research
EMILY WICK

Flavors — Their Utilization and Stability in Baked Goods
JACK FRIEDMAN

Two additional papers, one by Phillip Kiely and the other by Paul Orsay. Titles will be announced at a later date.

General Session

Characterization of Wheat and Milled Products by Staining Techniques
Y. POMERANZ and J. A. SHELLENBERGER

Micro Tests for Flour Quality
HOMER R. ELLING and M. A. BARMORE

The Use of Vegetable Gums in Layer Cakes
E. G. BAYFIELD

Fluorescence Microscopy in Cereal Chemistry
E. HANSSEN

A Simplified Method for Measuring Gas Production and Retention
DAVID E. DOWNS

Process Control in the Fermentation Industry

The Role of Process Control in the Manufacture of Industrial Enzymes
DR. EDWARD J. BECKHORN

Continuous Fermentation in Brewing Operations
EARL D. STEWART and STEPHEN LAUFER

Advances in Distillery Operations
IRWIN R. SHIPHERD

General Session

Changes in Individual Sugar Levels of Deteriorating Grain
B. T. LYNCH, R. L. GLASS, and W. F. GEDDES

The Chemical Composition of Wheat Lipids
J. H. NELSON, R. I. GLASS, and W. F. GEDDES

Identification of Carbonyl Compounds in an Ethanol Extract of Fresh White Bread
N. G. HAWKINS, D. J. REED, and J. W. PENCE

Some Volatile Carbonyl Compounds Arising During Panary Fermentation
F. E. KOHN, L. WISEBLATT, and L. S. FOSDICK

The Distribution of Vitamins in Commercial Mill Products
W. K. CALHOUN, F. N. HEPBURN, and W. B. BRADLEY

Study of Multiple Tables in Soda Cracker Production. I. The Effect of Iron
JAN MICKA

Baking and Baking Technology

Technological Problems and Nutritional Trends in Baking as Affected by New Food Laws in Germany
ANITA MENGER

A Comparison of the Active Dried Yeasts Produced in Different Areas of the World
N. STACEY

The Brew Process of Bread Production
J. A. THORN

The Volatile Organic Acids Found in Dough, Oven Gases, and Bread
L. WISEBLATT

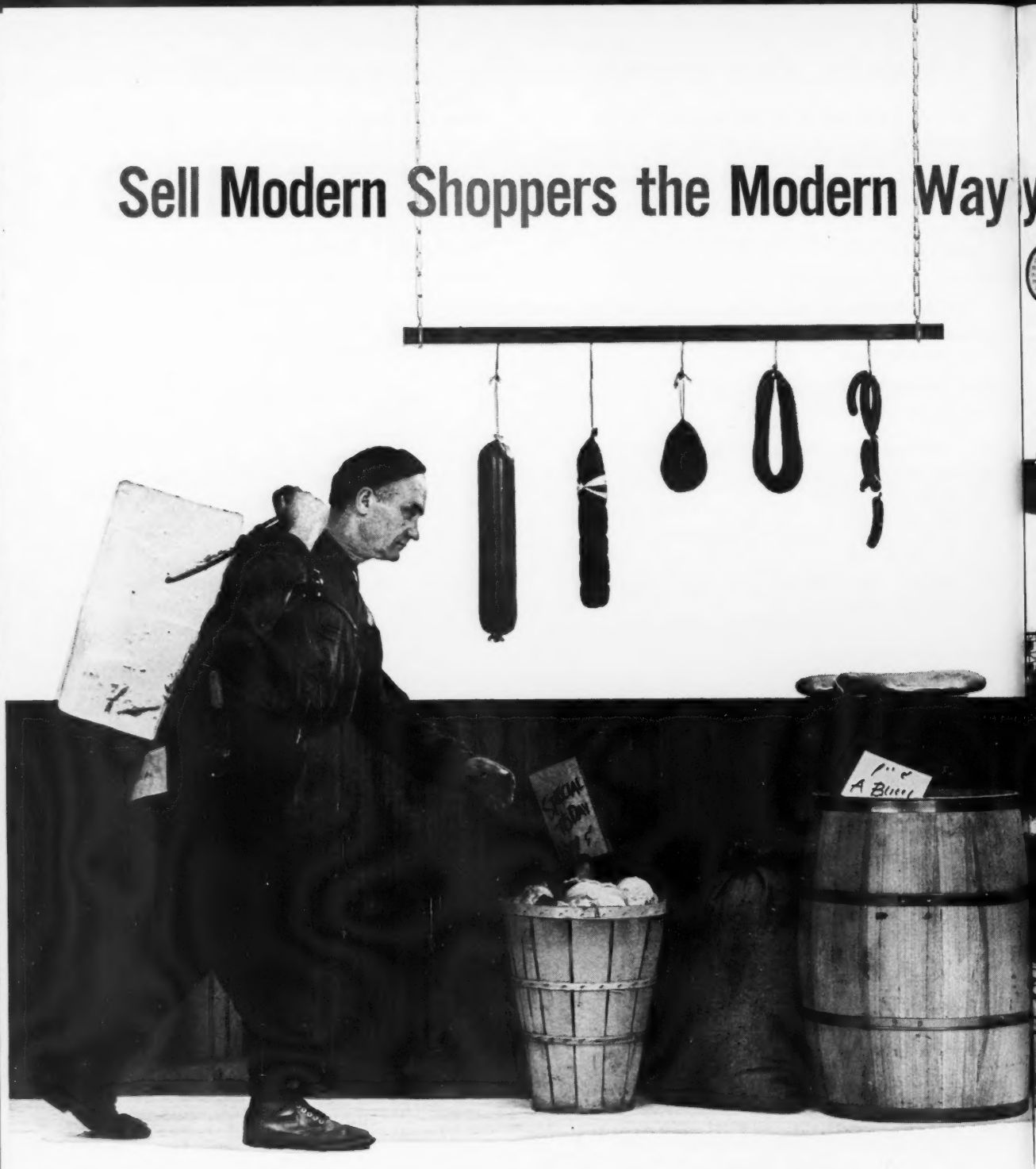
Some Aromatic Compounds Present in Oven Gases
L. WISEBLATT

Sulfhydryl Losses During Mixing of Doughs. Comparison of Flours having Various Mixing Characteristics
H. A. SOKOL and D. K. MECHAM

The Effect of Heat on Batters. III. Batters with Oil
EILEEN BRADY and R. C. A. BRADSHAW

Bubble Mechanics in Thick Foams and Its Effect on Cake Texture
A. R. HANDLEMAN and J. F. CONN

Sell Modern Shoppers the Modern Way



Would you dream of competing for today's food dollar with yesterday's processing, packaging or marketing methods? Of course not. Then why overlook the tremendous advances being made in nutrition? Vitamins and amino acids developed for food processing by Merck give you an opportunity to back up the appetite appeal and convenience of your products with the very latest nutritional story. Here are a few suggestions.

Fortification with Merck Ascorbic Acid provides strong vitamin C claims for any number of products—from gelatin desserts and instant potatoes to fruit juice blends and instant drinks. Merck Lysine can improve protein quality of wheat-based cereals and specialty breads and other processed vegetable foods. Vitamins B_{12} and B_6—both pioneered by Merck—are musts for all ages, are loaded with consumer appeal, give you unlimited opportunity for offering shoppers extra nutritional value in your products.

If you have new products in the works, or are looking for ways to modernize and stimulate sales of existing products—remember that Merck offers nearly a dozen nutrients for fortification. All are easily adaptable to normal food processing operations.

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WALDON H. HASTINGS and G. S. MILLER

Some Aspects of Quality Control of Microingredients as Used in Animal Feed Products
R. C. WORNICK and G. O. KUHN

Feed Microscopy and Its Applications
MAXWELL L. COOLEY

Microingredients and Statistical Quality Control
W. L. BENDER

Protein Analysis for Feed Formulation
R. O. NESHEIM

Balancing the Protein of Cereal Grains with Synthetic Amino Acids
R. S. GORDON, K. H. MADDY, L. J. MACHLIN, and G. L. ROMOSER

The Physiological Role of Antioxidants in Animal Feeds
R. S. GORDON, L. J. MACHLIN, and K. H. MADDY

Grain Structure, Starch and Amylases

Protein Granules in Maize Endosperm Cells
DONALD N. DUVICK

Steeping Studies with Corn Horny Endosperm Sections
STANLEY A. WATSON and EUGENE H. SANDERS

The Degree of Crystallinity of Granular Starches as Measured by X-ray Diffraction
H. F. ZOBEL and F. R. SENTI

Structure of the Starch Granule. II. Action of Various Amylases on Granular Starches
HARRY W. LEACH and THOMAS J. SCHOCH

A Thermoanalytical Study of Starch Gelatinization
J. T. WILSON and D. H. DONELSON

Characterization of Intermediate Fractions of High Amylose Corn Starch
ROY L. WHISTLER and WILLIAM M. DOANE

Crystallization of Starch Oligosaccharides and Oligosaccharide-Iodine Complexes
DEXTER FRENCH and R. WILLIAM YOUNGQUIST

Studies on the Acid Hydrolysis of Starch
JOHN J. KAGAN and M. DOREEN SMITH

The Effect of the Stability of Malt *Alpha*-Amylase on Its pH Optimum
R. M. SANDSTEDT, DONNA STRAHAM, and B. D. HITES

Marketing Research and Statistics

The Means of Control of Your Production
WARREN E. JONES

New Means of Forecasting Market Needs
DICK W. TWEDT

David B. Goliath — Milani Beat The Giants
MARVIN GORDON

Motivation Underlying Consumer Behavior
CHARLES MCCANN

Experimental Design and Stimulation in Research and Development
JACK THORNBY

The Underveloped Economy — A Challenge in Food Supply
MAURICE V. SORENSON

Cereal Protein Research

A Lipo-Protein Model of Gluten Structure
J. C. GROSSKREUTZ

Electrophoretic Composition and Intrinsic Viscosity of Glutens from Different Varieties of Wheat
J. E. CLUSKEY, N. W. TAYLOR, HELEN CHARLEY, and F. R. SENTI

Water Soluble Zein by Selective Deamidation
L. G. UNGER and L. MORRIS

The Distribution of Amino Acids in Commercial Mill Products
F. N. HEPBURN, W. K. CALHOUN, and W. B. BRADLEY

Methods and Gadgets Useful in Control

A Simple Volume Measuring Device for Layer Cakes
D. E. WILBUR

Method of Direct Reading Moisture Determination
H. J. LOVING

Layer Cake Viewing Device
H. J. LOVING

Modification of the Oxygen Bomb Stability Technique
R. L. SAMPSON

Quick Method for Determining Diastatic Activity
R. S. TERRELL

Technique for Obtaining Uniform Dough Thickness
F. R. SCHWAIN

Use of a Color Meter in the Malting Industry
S. D. BICHLER

Straight Tube Monometer Method for Soda Determination
R. G. PIPPITT

Rapid Method for Flour Estimation
R. G. PIPPETT

MORE RELIABLE

THAN TEST WEIGHT

A Wheat Sizing Technique for Predicting Flour Milling Yield

By William C. Shuey, Products Control Department, General Mills, Inc., Minneapolis, Minn.

SINCE PASSAGE OF the Grain Standards Act of 1916, wheat has been graded according to standards established by the Federal Government. Test weight or pounds per bushel has been an important factor in the grading system. It is generally agreed that test weight and flour yield are related[1] (1,2,3,6). However, experience indicates that the test weight is only a rough, and many times an unreliable, index of flour milling yield. Wheats may have as much as nine lb. per bushel difference in test weight with the same milling yield (total flour extraction), as shown in Table I.

Table I. Test Weight and Flour Yield

	Test Weight lb/bu	*Flour Yield* %	*Test Weight* lb/bu	*Flour Yield* %
	47.6	69.5	57.0	68.0
	48.2	72.1	59.9	71.7
	54.5	74.6	61.8	74.2
	56.8	76.1	63.3	75.8
Av.	51.8	73.1	60.5	72.4

There are many factors influencing test weight. Moisture content of the wheat kernel, smoothness of the bran covering, shriveled wheat, and the wheat variety are a few of these factors. Some wheats, such as Tenmarq, inherently give low test weights but will consistently yield more flour than other varieties with higher test weights.

Test weight of a wheat lot may be changed, without a corresponding effect upon flour yield. For example, just handling the wheat polishes the bran coating and causes an increase in test weight but no change in flour yield. A sample of bleached wheat can have a lower test weight, but a higher flour yield, than one of unbleached wheat. A shriveled sample may have the same low test weight of a bleached sample, but its flour yield would be much lower. This paper presents a simple testing technique which can be used to predict flour milling yield more reliably than will test weight per bushel.

[1] Association of Operative Millers, correspondence course in flour milling.

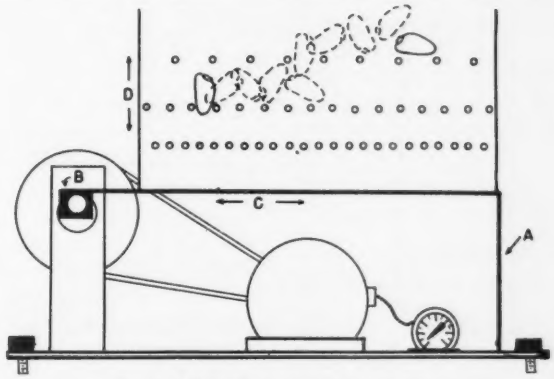


Fig. 1. Schematic diagram of wheat sizer.

Experimental Work

The wheats tested were weekly composite samples of 18 different mill mixes from nine commercial mills representing the 1956, 1957, and 1958 crop years. In all, 1,892 samples were tested. Test weights were determined in the usual manner. The basis for calculation of yields or total extractions was that of clean dry wheat (untempered wheat).

The wheat was sized according to the cross-sectional area in a mechanical wheat sizer (Fig. 1).

The sizer consists of two main sections. Section 1 is a sieve carriage mounted at one end on flexible strips of spring steel, *A*. The opposite end is mounted on an eccentric, *B*, by which the carriage is driven. This type of mounting produces a rolling action to the kernels resting on the sieves which are placed in the carriage. The horizontal motion (*C*) upends the kernels, allowing them to be graded according to their cross-sectional area. The vertical motion (*D*) produces the thrust upward, causing the kernels to pass through the sieve if small enough. The effect of this action on a kernel is illustrated in Fig. 1.

In section 2, three wire sieves were selected to give a good gradient difference between the three sized fractions, as shown in Fig. 2.

For correlating sizing yield and mill yield, a series of sizing results are compared with the commercial mill yield. Assigned potential flour yield values are given the overs of each sieve which correlate with the milling unit. The value will depend on the efficiency of the particular unit being studied. For example, Mill I was a less efficient milling unit than Mill II. The correlated sizing results on these two mills were as follows:

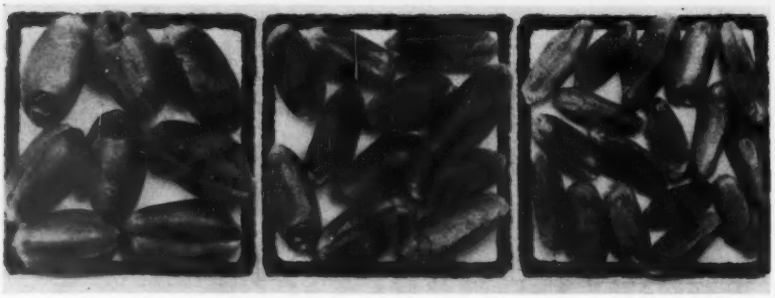


Fig. 2. Relative differences in kernel sizes. Left, over top sieve, 8 kernels; middle, over middle sieve, 11 kernels; right, over bottom sieve, 17 kernels.

Assigned Potential Yield for Overs	*Mill I*	*Mill II*
	%	%
Top sieve	74	80
Middle sieve	72	74
Bottom sieve	65	70

The sizing results for these mills were:

	Mill I	*Mill II*
	%	%
Over: Top sieve	67	50
Middle sieve	31	48
Bottom sieve	2	2

Multiplying the assigned potential yields for each mill by the respective percentages of the overs of each sieve, the potential calculated yield was 73.2% for Mill I and 76.9% for Mill II. The actual commercial mill yields were 73.5 and 76.9% respectively. The wheat lot for Mill I is better than that for Mill II. If this lot had been ground on Mill II a 77.9% flour yield would have been obtained. A 250-g. sample of cleaned or docked wheat is sized for 3 minutes.

Analysis of the Results

The data given in Table II are the yearly average results for the wheat mixes studied.

The averages of the crop years show relationship between test weight and mill yield. However, the individual results, plotted in Fig. 3, show that there is a poor correlation between test weight and mill yield.

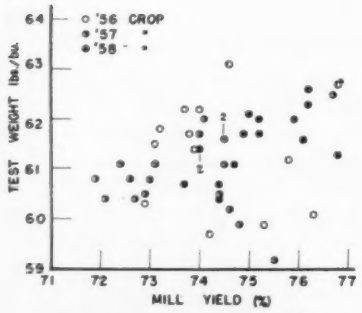


Fig. 3. Test weight vs. mill yield.

Mangels and Sanderson (3) found an average correlation coefficient between test weight and mill yield of +0.762 for the years 1916 through 1924. For the years 1949 through 1954 on 287 tests we obtained a +0.744 correlation coefficient between test weight and milling yield. Note the remarkably good agreement between the two correlation coefficients.

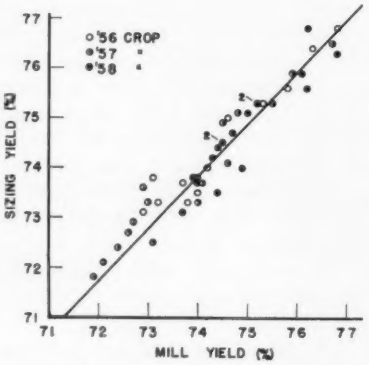


Fig. 4. Calculated sizing yield vs. mill yield.

The calculated sizing yield versus the mill yield is plotted in Fig. 4. +0.957. This shows a much higher degree of correlation to mill yield than test weight.

In a series of studies made from 1949 through 1954, the correlation coefficient between sizing yield and mill yield on one milling unit was +0.982 for 139 samples. Yields ranged from 72.5 to 77.5% for these samples.

Factors to Be Considered

The technique of sizing wheats

Table II. Comparison of Sizing Yield, Mill Yield, and Test Weight

1956 Crop Year			*1957 Crop Year*			*1958 Crop Year*		
Calculated Sizing Yield	*Commercial Mill Yield*	*Test Weight*	*Calculated Sizing Yield*	*Commercial Mill Yield*	*Test Weight*	*Calculated Sizing Yield*	*Commercial Mill Yield*	*Test Weight*
%	%	lb/bu	%	%	lb/bu	%	%	lb/bu
73.1	72.9	60.3	71.8	71.9	60.5	73.1	73.7	60.7
73.3	73.2	61.8	72.1	72.1	60.4	73.5	74.4	60.7
73.3	73.8	61.7	72.4	72.4	61.1	73.7	74.0	61.4
73.5	74.0	62.2	72.5	73.1	61.1	73.8	74.0	61.4
73.7	73.7	62.2	72.7	72.6	60.8	74.0	74.9	61.7
73.8	73.1	61.5	72.9	72.7	60.4	74.2	74.4	60.4
73.8	73.9	61.4	73.3	73.0	60.8	74.5	74.5	61.6
74.0	72.2	59.7	73.3	74.0	61.7	74.7	74.7	61.1
74.5	74.5	61.6	73.6	72.9	60.5	75.1	75.0	62.1
75.0	74.6	63.1	73.7	74.1	62.0	75.3	75.2	61.7
75.3	75.3	59.9	74.1	74.6	60.2	75.3	75.2	62.0
75.6	75.8	61.2	74.4	74.4	60.5	75.6	76.2	62.3
76.4	76.3	60.1	74.9	74.5	61.1	75.9	76.1	61.6
76.8	76.8	62.7	75.1	74.8	59.9	76.3	76.8	61.3
			75.3	75.5	59.2	76.8	76.2	62.6
			75.9	75.9	62.0			
			76.5	76.7	62.5			
Av. 74.4	74.4	61.4	73.8	73.8	60.9	74.8	75.0	61.5

The correlation coefficient between sizing yield and mill yield was will show the differences in potential milling yields of various wheat lots. However, since two units may not realize the same yield on a given lot of wheat because of flour specifications and mill flow, it is necessary to correlate the sizing results with each individual unit for accurately predicting the milling yield.

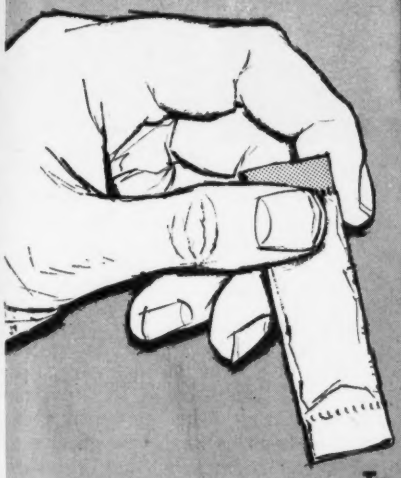
Sized wheats give a good measurement of the ratio of bran to endosperm by sizing according to average cross-sectional area. Differences in bran thickness are not an influencing factor, because milling is macroscopic in nature whereas bran thickness measurements are microscopic. Shellenberger and Morgenson (3,4) demonstrated that there are differences in bran thickness of wheat varieties, but the measurement of these differences could not be used to predict flour yield differences.

The range between two such sizers in different laboratories and oper-

(Please turn to page 75)

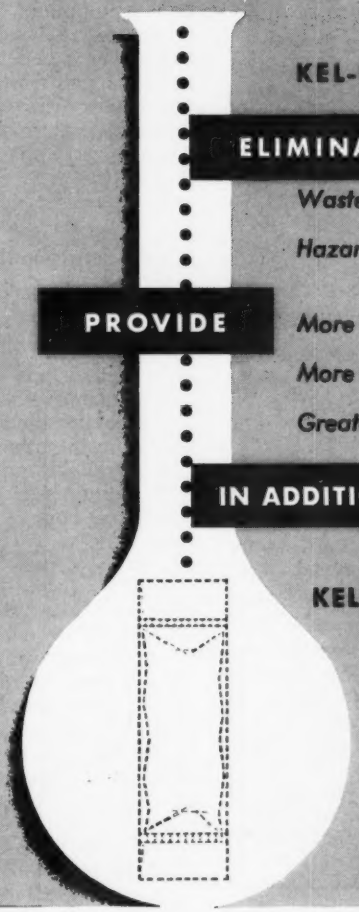
FOR YOUR CONVENIENCE

Harshaw KEL-PAK Digestion Catalyst Powders



Harshaw KEL-PAK Powders are carefully compounded mixtures of Potassium Sulphate; Mercuric Oxide and/or Copper Sulphate in sealed polyethylene packets containing sufficient catalyst for one protein determination.

To use, simply drop one packet into flask



KEL-PAK POWDERS

ELIMINATE
- *Messy mixing operations*
- *Waste due to spillage and spoilage*
- *Hazardous handling of mercury or its compounds*

PROVIDE
- *More uniform mixtures*
- *More accurate additions*
- *Greater speed in adding catalyst to flask*

IN ADDITION..
- *Polyethylene packet reduces foaming*

KEL-PAK POWDERS are available in 5 formulas

#1 9.9 grams K_2SO_4; .41 gram H_2O; .08 $CuSO_4$
#2 10 grams K_2SO_4; .3 gram $CuSO_4$*
#3 9 grams K_2SO_4; .35 gram H_2O*
#4 10 grams K_2SO_4; .7 gram H_2O*
#5 15 grams K_2SO_4; .7 gram H_2O*

* Meet A.O.A.C. specifications

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People, Products, Patter

• • • People

Alvin C. Anderson, Jr., appointed to position as laboratory baker with Standard Milling, Buffalo.

Joseph R. Breisch and **George D. Pickett** appointed assistant sales managers for all grades and granulations of Lactose by Western Condensing Co., division of Foremost Dairies. Mr. Breisch will direct the company's distributor sales in the eastern half of the country, and Mr. Pickett for the western half.

Paul M. Cormack appointed technical sales representative in metropolitan New York area for Sterwin Chemicals Inc.; will call on users of vanillin, certified food colors, and vitamins, among others.

Robert N. DuPuis elected vp-research, General Foods Corp.; will assume leadership of corporate research activities, including supervision of research center at Tarrytown, N.Y.

Ellis D. English, president of Commander-Larabee Milling Co., Minneapolis, named president of Millers' National Federation; will be installed at the group's annual convention in Chicago May 9–11, becoming the 34th president. He succeeds **D. H. Wilson** of Chicago.

C. G. Harrel has been appointed consultant to Seymour Foods, Inc., of Topeka, Kansas. The company is a major processor of poultry and eggs.

J. William Haun appointed director of physical research, Central Research Laboratories of General Mills Inc.; will also direct activities in packaging, milling, and mechanical engineering. Replaces **L. F. Borchardt** who recently became managing director of the Laboratories.

Paul Khan named manager of Central Research Laboratories, DCA Food Industries. **Bernard Brachfeld** succeeds to Mr. Khan's former position as director of DCA's Downyflake Foods Laboratory.

William E. Kreiner re-elected president of Barley and Malt Institute; re-elected also were **Robert L. Testwuide** as vp, **Fred E. Raraty** as treasurer, **Alan R. Graff** as secretary, **Walter W. Hiss, Jr.,** as assistant treasurer, and **Robert H. Every** as assistant secretary.

Herbert Kurth elected president of Malting Barley Improvement Association; **Clarence W. Johnson** and **Frank H. Schwaiger,** vp's; **Arnold J. Goede,** treasurer; **Thelma T. Richards,** secretary; and **A. J. Lejeune,** executive director.

Vincent Lawson now employed at Terminal Flour Mills in Portland, Ore.; from Pillsbury Co., Buffalo.

Raymond D. McMurray elected secretary of Hoffman-LaRoche, Inc.; succeeds **Hans H. A. Meyn** who has served in this post for nearly 40 years. **Samuel L. Welt** appointed as patent counsel, and **Maurice W. Levy** to newly created post of trade counsel.

Gustav Rapaport, 59, president of Food Products Corporation, Kansas City, Kansas, died November 25, 1959, at Menorah Hospital, Kansas City, Mo. An AACC member for many years, Mr. Rapaport was also a member of the American Chemical Society.

R. Tkachuk and **C. C. Tsen** join research staff of Grain Research Laboratories, Winnipeg; both working in basic wheat research section headed by **I. Hlynka.** Dr. Tkachuk formerly at University of Saskatchewan; Dr. Tsen recently a fellow of National Research Council (Canada) at University of Alberta, Edmonton.

H. W. Tripp elected Director of Wallace & Tiernan, Inc.; he is financial vp of University of Rochester, and holds other directorships including Chemical Fund, Inc. of New York City; Haloid Xeroc, Inc., and Allerton Chemical Co., both of Rochester, N. Y.

• • • Patter

Anniversary. Fries & Fries, Inc., of Cincinnati and New York, observes its 106th anniversary this month. Established in 1854 by the Fries family, the company has grown from a small manufacturer of flavors, extracts, and caramel colors to one of the country's best-known suppliers of essential oils, aromatics, flavors, and perfume bases. Three generations in the industry, together with constant emphasis on research and development, have given Fries & Fries the basic ingredients for service to their customers – long experience and progressive outlook.

• • •

Bulk flour handling in Dallas. A new and efficient system of bulk flour handling and storage was recently installed by Frozen Rite Products, Inc., Dallas, Texas. Each of two news bins has a capacity of approximately 45,000 lb. of flour; the tank-type flour truck drives directly to the plant site, and the flour is quickly unloaded into bins with compressed air. From this point, the flour is handled in the usual way.

This new bulk flour system is termed by Irving H. Conroe, president and board chairman of Frozen Rite, to be a big advancement over their previous handling, though even the old flour-handling system was quite an innovation when it was installed. At that time, he pointed out, the aluminum bins of 3,000-lb. capacity, teamed with the flour of high-protein, low-ash type used for Frozen Rite rolls, brought about a major change in the type of baking then typical of breadmakers – it gave impetus to the use of so-called "hot" flour direct from the mills to the bakeries.

Plans are now under way for further expansion of the company's product line in baked-and-frozen bakery products, as well as many unbaked frozen items.

• • •

Cake doughnuts from super-aerated batters. Recent Pillsbury

search with "Air Whisk" equipent for cake-doughnut batters s discussed during informal proction meetings at a January conntion of the Pennsylvania Bak Association. Ray Thelen, techcal director of The Pillsbury Co.'s kery mix division, described the hisking" process: batters are ixed under air pressure of 5–22 per sq. in. – thus the "superation." He cited three major adntages: an increase of water abrption by 3%, a 6% increase in ecific volume of the doughnuts, d 25% reduction in fat absorpn. "Conservative estimates," he id, "point to a saving of $2.67 for ery 100 lb. of mix."

Glass:

(Continued from page 62)

e more tightly bound ones, though the readily extractable flour pids are also of some importance, resumably by virtue of their becomg bound during the doughing proc- s and hence being in very intimate ntact with the proteins. The ultiate products are unknown, but ey may perhaps be presumed to be e result of an interaction between tty acid hydroperoxides and proin. It would appear possible from is that the lipoxidase-unsaturated tty acid-protein system is of conderable importance in over-all flour uality and, if so, would be expected vary in efficiency between wheat arieties as well as between flour rades. The percentage of bound our lipid, for example, would be exected to vary considerably between lours, and hence these flours would so be expected to vary in their reponse to oxidation. Absolute differnces in lipid would not be as imortant, of course, as would be differnces in unsaturation. The interrelaons are so complex, however, that o one factor, such as a low or high odine number, could be selected as n index of quality or as a contributng reason for a flour being of good r inferior quality.

Perhaps the time will come when uch a selection will be possible. This, owever, will not be until we have omplete information of the constituts present, qualitative as well as uantitative; of the interactions hich take place between these constituents, and of the subsequent effect of these interactions on baking behavior.

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Wagner:

(Continued from page 64)

collective efforts to reduce the infinitesimal quantities of contaminants. On the other hand, we must recognize that individual companies and the combination of companies making up a single industry can solve only their own proportionate share of the problem.

The American people have the cleanest and most wholesome food supply in the world today. We must continue our collective and cooperative efforts until the minutest particle of contaminant from any source in the food on our dinner tables will be a thing of the past.

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Shuey:

(Continued from page 72)

ators was 0.3% on the split wheat samples. Reproducibility of one sizer is ± 0.1%.

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AACC
LOCAL SECTIONS

Nebraska Section met on January 30 at Castle Hotel, Omaha, a joint meeting with Nebraska Bakery Production Club.

Jim Doty of Doty Laboratories gave an illustrated talk on his recent visits with bakers and chemists in England, Germany, Portugal, and Italy. At least 60% soft wheat is used there, he said. Problems of bakers and chemists are entirely different from those in the U.S., and generally speaking, tests of the gluten and a special baking test are of the most help to them.

Avrom Handleman, Monsanto Chemical Co., St. Louis, spoke on "Contributions of egg-yolk components to baked products." He discussed latest research findings on the chemical composition of some of these components, and showed how they help in the volume and enrichment of baked products.

Robert Pruckler, Nebraska Consolidated Mills, Grand Island, received the Section's Shafer Trophy for the best average in flour check sample. This being the third successive year Bob has won the trophy, he now takes permanent possession of it. In the cut, he is at the left; Bennett Hites (right), chairman of the award committee (biochemistry and nutrition department, College of Agriculture, Lincoln) is shown presenting the trophy.

• • • •

Cincinnati Section held its winter meeting on January 23 at Fort Hayes Hotel, Columbus, Ohio. The program was opened by Raymond Blackmore, chemist-in-charge of Food Division, Ohio Dept. of Agriculture, who spoke on "The food technologist's role in customer protection."

Carl Gustafson, director of flour laboratory, Wallace & Tiernan Inc., Chicago, showed a sound film in color of the Baker continuous breadmaking system, and explained the installation and advantages of the Dō-Maker process.

"The effect of particle size on vital wheat gluten color" was discussed by Robert High of Keever Starch, Columbus. He showed how, with the use of color standards, dry gluten color is controlled by changing the granulation.

Following noon luncheon, Jack Wilson of the Soft Wheat Quality Lab, Wooster, Ohio, talked on "Water loss in cake-baking." He showed the results of volatiles lost during various stages of baking, when the batter contains varying percentages of water.

Closing speaker was Bill Webb, area supervisor USDL, Columbus, who talked on "The purpose of the Bureau of Apprenticeship and Training." Automation and new-product development, he said, have increased the need for personnel "know-how," and this department assists industry in setting up training programs.

Jay Hedding is chairman of the nominating committee for new officers.

New members: Arthur Gust, F. W. Stock & Sons Inc., Hillsdale, Mich.; Wilbur Robinson, Dawn Do-Nut Co., Jackson, Mich.; and J. P. Drake, Central Soya Co., Marion, Ohio.

• • • •

Kansas City and Pioneer Sections are presenting the following program for their joint meeting at the President Hotel, Kansas City, Mo., on February 26 and 27:

Friday evening, cocktail hour and informal discussions, followed by a film entitled "Essential oils of South America" – Fritsche Bros., Inc., filmed by Ernest Guenther.

Saturday morning: "Computers in feed formulation" – W. H. Harding (KSU Milling Dept.); a film, "A compass for agriculture," with commentaries and recent statistics from the Wheat Crop Survey – J. E. Palleson (Kansas Crop & Livestock Reporting Service); "The baker looks at flour" – R. H. Cotton (Continental Baking); "Observations and commentaries on European bread and flour production" – J. M. Doty (Doty Laboratories).

• • • •

Pacific Northwest Section suggests: Plan your summer vacation now; attend the Section's annual meeting June 20 and 21 in Bozeman, Montana, only 90 miles from Yellowstone National Park.

• • • •

Midwest Section met on February 1 to hear Albert I. Kegan, a specialist in food law, speak on "Where the food industry stands under the Food Additives Amendment." The subject is a vital one, for few people are fully aware of the many ramifications of this amendment or how it will affect their present products or the course of their search for new ones.

The law firm of which Mr. Kegan is a member is counsel for many food manufacturers throughout the Chicago area; he himself worked for a time as a chemist for the U.S. Food and Drug Administration, and has taught chemical engineering.

Mr. Kegan gave as the general philosophy underlying the Food Additives Amendment the concept that every substance has a minimum-effect level and all additives except carcinogens will be allowed at 1% of the highest no-effect dosage. The nonallowance of carcinogens is contradictory to the "minimum-effect" concept. A chemical allowed in one food cannot automatically be used in other foods, because the minimum-effect dosage may be different.

Mr. Kegan condemned the secrecy clause in the bill because of possible abuse. He suggested an amendment that will require publication of a test method and results one year after a chemical is cleared. He also suggested a policy of self-policing to relieve the load on the FDA. Substances now given general release are food components, not additives.

The current wave of requests for guarantee by a manufacturer is fruitless, because such guarantees have no legal value except for a person who resells a packaged product, or if a local law requires such a guarantee. The person who adds the chemical or packages the product is responsible.

GLOSS *Paramount Style*

How Durkee's Continuing Research Kept Coatings from Turning Gray

THE PROBLEM: *find a better hard butter.* Durkee's Technical Research Staff set out to find one. They wanted a hard butter that would produce confectioners' coatings with better performance characteristics than existing coatings. Specifically, they wanted high gloss retention, greater stability and resistance to bloom under all temperature conditions.

THE SOLUTION: *methodical.* Durkee research went to work. Coating after coating was tested in the laboratories . . . placed in cycling cabinets which duplicated shelf temperature changes . . . checked by taste panels . . . subjected to exact conditions encountered in the plant. Durkee even built a pilot plant with miniature equipment to simulate actual plant conditions. As a result, a hard butter for making coatings that met every industry requirement was developed. Durkee named it Paramount; confectioners call it "wonderful".

THE SIGNIFICANCE: *clear.* Durkee has been researching fats and oils for 40 years—and is still hard at it. The development of Paramount is typical of purposeful research continually in progress in Durkee's Technical Service Laboratories. Here is where we may be able to help you most whenever your product or process warrants further attention. We'd be glad to help. Just 'phone us or write.

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QUALITY Glidden PRODUCTS

Mr. Kegan suggested several steps one may take to determine if an additive can be used: 1) Examine issued orders of food additives. Only five have been listed. The list will grow very slowly. 2) Ask the seller for a photostatic copy of the FDA clearance letter. 3) Examine the exempt list of 300 to 400 chemicals. 4) Look in the food standards list. 5) Obtain a prior-sanction letter from the FDA. 6) Petition for clearance.

Chairman Feigon announced that the Section will again sponsor a luncheon at the annual meeting of the American Society of Bakery Engineers at Edgewater Beach Hotel, March 9.

At the March meeting, Roy C. A. Bradshaw, Quaker Oats Co., will talk on "Some properties of batter proteins."

New members: R. W. Stromberg, Central Soya Co.; Clifford Steightiff, Wilson & Co.; Forrest Goff, Victor Chemical; Richard T. Fukuda, Armour & Co.; Eugene Soulé, Py-O-My.

• • • •

Toronto Section's January event (21st) was a visit to the Redpath Sugar Refineries in that city. Although the refinery was not in operation, other phases of the planned program were carried out to everyone's satisfaction. J. Morrison, assistant sales manager, reviewed Redpath's history and outlined the influence of population and of the Seaway in the planning of new facilities. A very interesting film, "The crystal of energy," illustrated the harvesting and refining of beet and cane sugar, and showed the influence of automation. Dick Brown, chief chemist, thoroughly discussed all phases of plant and quality control. A tour of the laboratories was most interesting, especially the continuous analyzer on steam condensate returns to the boiler to prevent leakage of sugar. About 60 people were present, including nine graduate students in the University of Toronto's Food Chemistry Department.

The Section welcomed National President D. B. Pratt, Jr., for its February 17th meeting at the Carleton Club, Toronto, to get acquainted and hear his message on communications problems between management and personnel in quality control.

For the March meeting, R. A. Chapman, Department of Health and Welfare, will speak on a matter of widespread interest and concern – legislative controls of food additives in the United States and Canada. It will be a joint meeting with members of the Canadian Institute of Food Technologists.

New members: Dennis Clayton, General Mills, Inc., Weston, Ont.; Tony Krauchuk, Research Lab., Maple Leaf Milling Co., Toronto.

• • • •

Canadian Prairie Section met in the Grain Exchange Board Room in Winnipeg on January 19, jointly with members of the Canadian IFT. L. M. Shebeski of the University of Manitoba spoke on "The development of new wheat species and their potential." Prof. Shebeski gave a brief explanation, illustrated by slides, of the way in which plant cells are produced by subdivision. He discussed at length the importance of genetics as applied to plant breeding and the effects the plant chromosomes have in cross-breeding. Prof. Shebeski's department is currently investigating a new species which they have developed and which they believe to have good commercial value.

Plans were aired for the forthcoming conference of the CIFT to be held in Winnipeg next June.

New members: Russell Tkachuk and Gary C. Martin, both of the Grain Exchange Laboratories.

New York Section's guest on January 12, AACC National President D. B. Pratt, Jr., presented to immediate Past President Clinton L. Brooke a plaque in recognition and appreciation of Mr. Brooke's tenure of office. Mr. Pratt also informed the Section of the progress being made in planning for the national meeting in Chicago in May, and gave a summary of activities of various other sections which he has visited throughout this country and Canada.

• • • •

Niagara Frontier Section members enjoyed a cocktail party at the home of William Davis, on February 15; courtesy of Sterwin Chemical Co.

This was preliminary to a pot-roast dinner in Norton Hall at the University of Buffalo. Immediately following the dinner, National President D. B. Pratt talked informally on Association affairs and news, then gave a formal talk on "Management looks at quality control – a communications problem."

Gerald Mruk of Russell-Miller Milling Co. was elected secretary-treasurer, replacing Vincent Lawson who is now employed in Portland, Ore., with Terminal Flour Mills.

James B. Tollen, Jr., of Riverside Chemical, is a new member.

DETMOLD STARCH CONGRESS

The 1960 Starch Congress of the Association of Cereal Research will be held in Detmold, Germany, April 20–22. The following program has been announced:

General Lecture: F. Micheel (Münster, Germany), "Synthesis of polysaccharides *in vitro*."

Research papers:

O. Hövels (Erlangen, Germany) — "Selected examples of the physiology and pathology of carbohydrate metabolism in infancy"

M. Samec (Ljubljana, Jugoslavia) — "The effect of gamma radiation on the properties of different starches"

A. R. Deschreider (Brussels, Belgium) — "Modifications observed in the polysaccharides of flours treated with ionizing rays"

J. A. Radley (Reading, Berkshire, England) — "The effect of electron bombardment on starch"

S. Winkler (Berlin, Germany) — "The properties of potato starch in relation to maturity of the tubers"

W. J. Whelan (London, England) — "Action patterns of the alpha-amylases"

C. T. Greenwood (Edinburgh, Scotland) — "The molecular properties of the components of starches"

E. D. Klug, (Wilmington, Delaware) — "A comparison of starch with cellulose: The effect of the degree of order on reactivity and derivative properties"

M. Ansart (Corbeil, France) — "Various tests of starch as applied to the paper industry"

F. Schierbaum (Potsdam-Rehbrücke, Germany) — "Hydration of starch"

M. Ulmann (Potsdam-Rehbrücke, Germany) — "Solution conditions of amylopectin and amylose in starch dispersions"

A. Guilbot, R. Charbonniere, P. Abadie, and H. Girad (Paris, France) — "The sorbed water of starch: Study by X-ray spectroscopy"

J. A. Radley (Reading, Berkshire, England) — "The use of the refractometer in the study of the swelling of starch"

R. M. Sandstedt (Lincoln, Nebraska) and W. Kempf (Detmold, Germany) — "The effects of salts on the gelatinization curves of wheat starch"

W. C. Bus, J. Muetgeert, and P. Hiemstra (Delft, Holland) — subject to be announced

A. Görner (Dresden, Germany) — "A new continuous dextrin process"

H. Stumpf (Braunschweig, Germany) — "The pneumatic mixing and wetting of dextrin and pregelatinized starch"

H. E. Duintjer (Veendam, Holland) — "Correlation of viscosity with D.E. value, specific rotation, iodine color, and ethanol turbidity of glucose syrups"

H. Wegner (Berlin, Germany) — "The identification of heavy metals in glucose by paper chromatography"

W. Kempf (Detmold, Germany) — "Comparative observations of European and American starch research and starch industries"

American cereal chemists are cordially invited to attend the Detmold Congress. A concurrent program of sightseeing and luncheons has been arranged for the ladies. To ensure accommodations, it is suggested that reservations be made well in advance. Further information can be obtained by writing Dr. W. Kempf, Federal Research Institute of Cereal Industry, 9 Am Schutzenberg, Detmold, Lippe, Western Germany.

NUTRITION

ROLE OF THE FOOD AND NUTRITION BOARD IN THE NUTRITIONAL IMPROVEMENT OF CEREAL PRODUCTS

On October 30, 1959, Robert R. Williams announced his retirement as a member of the Food and Nutrition Board and as Chairman of its Committee on Cereals. For 19 years Dr. Williams had guided a committee of the Board with the judgment of a scientist, the zeal of a missionary, and the astuteness of a lawyer toward the objective of attaining maximum nutritional benefits from cereal foods for populations faced with food deficits. This was not all as simple as it would seem to those who were never exposed to the frustrations of ignorance, competitive forces, and legal complexities.

On the occasion of Dr. Williams' retirement, Charles N. Frey, on behalf of the current members of the committee (W. B. Bradley, C. N. Frey, W. F. Geddes, F. L. Gunderson, E. J. Lease, and G. C. Thomas), read into the record of the Board the following statement:

> "In view of the retirement of Dr. Robert R. Williams from the Chairmanship of the Committee on Cereals, the remaining members wish to pay special tribute to Dr. Williams. He has been to each of us a great, friendly, constructive, inspirational, and dedicated leader. His services to the nation and to the world in the field of science and in the cause of better nutri-

tion are beyond estimate. We shall always cherish the memories of his devotion to worthy objectives, his concern for improving the public welfare, and his kindly personality. It is hoped that Dr. Williams may continue to make his advice and counsel available to the Committee on Cereals."

The Board, in turn, expressed its own appreciation to Dr. Williams in a resolution as follows:

"Members of the Food and Nutrition Board of the National Academy of Sciences–National Research Council extend to their esteemed friend and colleague, Robert R. Williams, at the time of his retirement from the Board, an expression of their best wishes for the years ahead and their great sense of gratitude for his valuable services in the years past. Since the Board was formed, Dr. Williams has worked constantly in establishing a record characterized by sincerity, imagination, good judgment, and technical knowledge in the science of nutrition. He has been a great, constructive, inspirational, and dedicated leader. His services to the world and to the nation in the cause of better nutrition are beyond estimate. Members of the Board will cherish a vivid memory of his kindly personality, his devotion to worthy objectives, and his concern for improving public welfare."

HIGHLIGHTS OF THE WORK OF THE COMMITTEE ON CEREALS

The most prominent contribution of the Committee has been through its activities on behalf of the "enrichment" of flour and bread, extended consequently to corn meal and rice. "Enrichment" is put in quotes because of the legal confinement this term assumed upon establishment of definitions and standards of identity for "enriched" wheat flour by the Food and Drug Administration in May 1941.

A history of the movement for the enrichment of flour and bread was published in November 1944 as Bulletin 110 of the National Research Council. This report of 130 pages (now out of print) was prepared by Russell M. Wilder and R. R. Williams, with the aid of the Committee on Cereals. It was followed in June 1945 by a publication of 75 pages, "The nutritional improvement of white rice," issued as NRC Bulletin 112, prepared for the Committee on Cereals by M. C. Kik and R. R. Williams. This report is also now out of print.

One of the first undertakings of the Food and Nutrition Board was to assist in organizing the National Nutrition Conference for Defense which was called by President Roosevelt and held in Washington May 26-27-28, 1941. By this time the word "enriched" had been agreed upon, and FDA standards had been established for enriched flour and certain other products. Although hearings had been announced, there were no official standards for enriched bread. However, an "understanding" to accept the recommendations of the Food and Nutrition Board for enriched bread had been agreed to by the Food and Drug Administration and the American Bakers' Association. Accordingly, it was possible to inaugurate enrichment of bread as well as flour on the occasion of the National Nutrition Conference in 1941. Enrichment standards for enriched bread continued on an informal basis until May 15, 1952, except for a period starting in January 1943 when enrichment of all bakers' white bread was required by an order of the War Food Administration for the duration.

The Committee on Cereals worked vigilantly in promotion of the enrichment program. Although voluntary cooperation among large millers and bakers was outstanding, the committee encouraged legislative action for compulsory enrichment in many states. A series of pamphlets depicting "Facts about enrichment of flour and bread" was issued in 1944, 1946, 1947, 1948, and 1950 for aiding state legislative action as well as for general information. The final issue of this series was published by the National Academy of Sciences–National Research Council under the title "Cereal enrichment in perspective, 1958." At this time 27 states, Hawaii, and Puerto Rico had laws requiring enrichment.

Enriched bread and flour are to be found today in every grocery store and in most bakeries. The motive behind the enrichment program has been the nutritional improvement of certain basic foods at their sources through commercial channels. It was possible by this means to secure results promptly. The health of the population can be improved by education, but by itself education represents a long and difficult process. For immediate results in nutrition, as in sanitation, a degree of direct action is required. In this respect, enrichment of a staple food like bread is a public health measure analogous to correction of an unsafe water supply; once this is accomplished and the matter placed in competent hands, the benefits are permanently available to all.

LeRoy Voris

the President's Corner

news of the association

December was a quiet month insofar as travel was concerned; however, the New Year brought with it a number of visits to our local Sections, as well as other business. On January 12, I met with the New York Section for a very enjoyable evening. In addition to talking to the Section on Association affairs and my formal presentation, I had the honor of presenting Past-President Clint Brooke with a scroll given to him in honor of his work as President and Secretary of the Association. At the Speakers' table in New York were Past-Presidents Sherwood, Cathcart, Skovholt, Frey and Brooke. Another Past-President in the New York area, Hugh Parker, was unable to attend because of illness.

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On January 17 and 18, many of our officers and committee people were in Minneapolis for the annual Board of Directors Meeting. On Sunday Dr. MacMasters met

with her group on Cereal Laboratory Methods. The Editorial Boards met and many informal discussions were held. On Monday the Board of Directors considered many of the actions taken since our last meeting and approved the financial statement for operations during the past year and a budget for our business during the coming year. Reports were received from the Convention Group, as well as our capable business manager, Ray Tarleton.

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Among those subjects discussed at the Board of Directors Meeting and one on which action was taken, was the recent occurrence wherein committee information was utilized by a manufacturer in violation of the confidence of committee work. The Board of Directors approved action taken by your President in writing to the violator and severely criticizing him. In addition, the Board enacted into the Code of Regulations a by-law which should prevent recurrence of such an act in the future and permit the Association to take greater disciplinary action should it become necessary.

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During a trip to the West Coast, I visited with Bill Ziemke and Bill Prouty, both of whom are active in the affairs of the Western Sections. While in Ogden, Glen Blanch organized an informal dinner attended by twenty-five chemists and technical people in the nearby intermountain area, at which I was the honored guest. It was good to see that while this section of the country no longer is represented by a formal organization, they are still quite active and interested in the cereal field and can turn out an excellent group for meetings.

Plans are under way for visits during February to the Niagara Frontier Section, Toronto Section and the Chesapeake Bay Section; during March, the Canadian Prairie Section and the Nebraska Section; and finally in April, a joint meeting of the Northern and Southern California groups, just in time for our annual meeting in Chicago.

D. B. PRATT, JR.

BOOK reviews

The Physico-Chemical Properties of Wheat Proteins. S. C. I. Monograph No. 6. The Macmillan Co., New York, 1959. Price, $2.00. Reviewed by ROBERT L. GLASS, University of Minnesota, St. Paul.

This little book consists of six papers read at a symposium in London in March, 1957. Its title is misleading, since only three of the papers are concerned directly with wheat proteins. These are: "Some aspects of wheat and flour protein of interest to the milling and baking industries," presented by M. A. Cookson; "Physical properties of wheat protein systems," by P. Halton; and "Chemical aspects of wheat proteins," by J. Pace. The remaining three papers are only casually connected with the topic indicated by the book's title: "Mechano-chemical methods of studying the structure and reactivity of animal fibres," by J. B. Speakman; "The study of tissue proteins with particular reference to the proteins of muscle," by S. V. Perry; and "A physico-chemical approach to protein structure," by A. G. Ward and G. Stainsby. The latter paper is concerned almost exclusively with studies on gelatin and collagen.

The papers consist, essentially, of very brief reviews of the literature prior to 1957. This reviewer cannot recommend the book to cereal chemists.

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Evaluation of Protein Nutrition, a report of the Food and Nutrition Board, National Academy of Sciences-National Research Council, prepared by the Committee on Amino Acids; 1959, 60 pp.; price, $2.00. Available from the NAS-NRC, 2101 Constitution Ave., Washington 25, D.C.

An objective, comprehensive review that deserves careful study by the medical profession, nutritionists, and food processors. The importance of an adequate amount of good-quality protein in the diet is shown. This understanding of protein metabolism has been a great forward step in nutrition science. While certain population groups may be helped by practical application of this knowledge, the committee concludes there is little justification for any general additions of amino acids to basic foodstuffs in the United States at this time.

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The Heinz Handbook of Nutrition, edited by Benjamin T. Burton and an editorial board composed of Floyd S. Daft, Grace A. Goldsmith, Helen A. Hunscher, C. Glen King, W. Henry Sebrell, Jr., and Frederick J. Stare. Published for the H. J. Heinz Co. by the McGraw-Hill Book Co., Inc., New York, 1959; 439 pp.; price, $5.75.

Described in its subtitle as "A comprehensive treatise on nutrition in health and disease," this volume should prove to be especially useful as a reference book for those who have frequent need for an authoritative reference in the field of human nutrition.

■ ■ ■ ■

Principles and Procedures for Evaluating the Safety of Food Additives, by the Food Protection Committee, Food and Nutrition Board. Publication 750 of the National Academy of Sciences-National Research Council; Dec. 1959, 9 pp. Available from the NAS-NRC, 2101 Constitution Ave., Washington 25, D.C.

An earlier publication of the FPC was entitled "Principles and Procedures for Evaluating the Safety of Intentional Chemical Additives in Food." This is a revision with a fuller and slightly different treatment of some aspects of the subject. Evaluation of the safety of incidental additives is on the same basis as for intentional additives.

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Insect Pests in Stored Cereals is the 8th in a series entitled "Monographs on grain and malt products" prepared and distributed by Munton and Fison, Ltd., Stowmarket, Suffolk, England; 1959, 24 pp.

This succinct pamphlet points out the magnitude of the problem and discusses various means of insect control in stored grain. It is illustrated with clear, sharp photographs.

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Purdue University Agricultural Experiment Station has published three research bulletins describing soft red winter wheat varieties and their milling and baking characteristics. These are:

No. 680: **Knox and Vermillion, Early-Maturing Soft Red Winter Wheat,** by R. M. Caldwell, L. E. Compton, J. F. Schafer, and F. L. Patterson; 20 pp.; June 1959.

No. 681: **Dual, a Hessian Fly-Resistant Soft Red Winter Wheat,** by R. M. Caldwell, W. B. Cartwright, L. E. Compton, J. F. Schafer, and F. L. Patterson; 20 pp.; June 1959.

No. 682: **La Porte, Soft Red Winter Wheat,** by L. E. Compton, R. M. Caldwell, J. F. Schafer, and F. L. Patterson; 20 pp.; June 1959.

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Honey in Your Baking, by John A. Johnson, Donald Miller (Kansas State Univ.) and Johnathan W. White, Jr. (Eastern Utilization Division, USDA); Dec. 1959, 23 pp.; price 25 cents, from Extension Service, Kansas State Univ., Manhattan, Kansas.

Describes composition of honey and its use in a variety of home-baked products including breads, sweet doughs, and cakes.

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Composition of Cereal Grains and Forages, prepared by Donald F. Miller under the auspices of the Committee on Feed Composition of the Agricultural Board. This is Publication 585 of the National Academy of Sciences-National Research Council, June 1958. Copies may be ordered from the Publications Office, National Academy of Sciences-National Research Council, 2101 Constitution Ave., Washington 25, D.C.

Left, D. B. Pratt, Jr., AACC President; right, James W. Pence, Secretary; background, Stephen J. Loska, Jr., waiting to report to the Board.

Two AACC Directors from the Pioneer Section, Jeff. Schlesinger, left; John Giertz, right.

AACC Board in Action

On January 18, 1960, the Board of Directors of the American Association of Cereal Chemists met in Minneapolis at the Leamington Hotel for an all day session. Major topics considered were: 1959 and 1960 finances; upcoming Annual Meeting in Chicago. For details see p. 80 (President's Corner). Photos on this page taken by Clinton L. Brooke.

Left. Isydore Hlynka, Director; right, John A. Johnson, AACC's President-Elect.

Left, Kenton L. Harris, Technical Policy Committee Chairman and center, Paul E. Ramstad, Editor CEREAL SCIENCE TODAY join President-Elect Johnson for Board luncheon.

Pre-luncheon shop talk between Board members and visitors. Left to right, R. J. Tarleton, Executive Secretary, Marjorie Howe, Treasurer, and James W. Pence, Secretary.

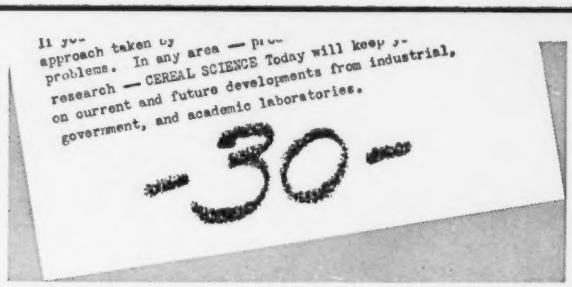
Observations

It is about time for Doty Laboratories to get out another Baker's Flour Report. Many mills were disappointed because their flours were not included in our last report. This is a warning: if you want your baker's flours included, send in each baker's flour brand produced for complete analysis by March 15 or April 1 at the latest.

Interest in flour granulation continues to increase. Although flours vary considerably, granulation is not, in our opinion, of vital importance in conventional baking procedures. We are convinced, however, that it is very important in continuous mix bakeries. Many operative millers are interested in both granulation and fractured-starch percentage, purely from a production point of view. Some millers are checking their flours from regular production, then making certain milling changes and again checking granulation and percent fractured starch. We feel sure much good will come of such research, for the day may not be too far away when the information obtained will be very valuable.

Everyone at Doty Laboratories had a very enjoyable 1959, and we look forward to even better times in 1960. We hope every cereal chemist is planning now to attend the 1960 convention in Chicago in May. The program looks most interesting and worthwhile. Remember you cannot serve your company to their best interest unless you attend conventions and meetings to keep abreast of new developments.

Jim Doty



MAY 1-5, 1960

Circle this week on your calendar. It's the date of the AACC's 45th Annual Meeting. Starting on page 65 of this issue you will find the Preliminary Program. It contains details of the Technical sessions as well as information on Local Arrangements.

The excellent response to last year's symposium on current trends in fundamental research led to this year's Monday afternoon session, "Viewpoints on Our Industry." It promises to be one of the highlights of the meeting.

A radical departure from our normal program will be noted on Thursday afternoon. Instead of the two separate business sessions usually held (one on Tuesday, one on Thursday), the Board of Directors has decided to hold *but one* business meeting, immediately after lunch on Thursday. It should last no more than an hour and all AACC members are urged to attend. *There will not be a technical session on Thursday afternoon.* This will enable everyone to meet the normal hotel check out time without the usual last minute rush.

The Farinograph Workshop will start at the close of the business session, estimated at 3:00 to 3:30 p.m. Registration will take place during the meeting for those who have not yet signed up. No registration will be accepted after 1:00 p.m. on Wednesday, May 4.

SANITATION SERIES

The first quarterly sample was mailed to all subscribers at the end of January. Returns are just beginning to come in and within a few weeks reviews should be on their way to each participant. The registration on this unique correspondence course in insect fragment recognition has exceeded our expectations for this early date. While we still accept subscribers, the number must be limited due to the amount of individual time that is given to each sample. So if you haven't registered and plan to, send in your application as soon as possible. First samples are still available.

AACC BOARD MEETING

The Board of Directors met in Minneapolis on January 18 to conduct their first meeting of 1960. A report on this meeting will be found on page 80 of this issue written by D. B. Pratt, Jr., AACC President. Every member of the AACC is requested to read it since it contains an important statement of policy regarding technical committee work.

VOTE NOW!

The AACC's official election ballot is in the mail. All eligible members may vote for the candidate of their choice in three categories, President-Elect, Treasurer, and Director. Terms for the latter two offices are for two years.

The names appearing on this ballot were selected in accordance with the AACC's constitution which permits free expression from the membership regarding nominees. Over 67% of the active members of the Association exercised their franchise on the nominating ballot. We hope that this figure will reach 85-90% on the election ballot.

NEXT MONTH

The April issue of CST will contain four papers presented at the Tri-Section meeting last October. They will be of great interest to everyone concerned with new wheat varieties.

In addition to the above, AACC members will find the official reports for 1959 from both the Technical and Association Committees. All members are asked to read these reports as they will be voted upon at the annual business session on Thursday afternoon, May 5.

R.J.T.